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Language of the proceedings: EN

Title of invention:
AQUEOUS POLYURETHANE DISPERSIONS

Patent Proprietor:
Taminco

Opponent:
AdvanSix Resins & Chemicals LLC

Relevant legal provisions:
RPBA 2020 Art. 12(6), 13(1)
EPC Art. 56

Keyword:
Late-filed facts - circumstances of appeal case justify admittance (no)
Inventive step - (no)

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Case Number: T 1856/22 - 3.3.03

D E C I S I O N
of Technical Board of Appeal 3.3.03
of 20 September 2024

Appellant: (Opponent)	AdvanSix Resins & Chemicals LLC 300 Kimball Drive, Suite 101 Parsippany NJ 07054 (US)
Representative:	Crooks, Elizabeth Caroline Kilburn & Strode LLP Lacon London 84 Theobalds Road London WC1X 8NL (GB)
Respondent: (Patent Proprietor)	Taminco Pantserschipstraat 207 9000 Gent (BE)
Representative:	Gevers Patents De Kleetlaan 7A 1831 Diegem (BE)
Decision under appeal:	**Decision of the Opposition Division of the European Patent Office posted on 13 June 2022 rejecting the opposition filed against European patent No. 3253812 pursuant to Article 101(2) EPC.**

Composition of the Board:

Chairman	D. Semino
Members:	D. Marquis
	L. Basterreix

Summary of Facts and Submissions

I. The appeal lies against the decision of the opposition division rejecting the opposition filed against European patent No. 3253812 pursuant to Article 101(2) EPC.

II. Granted claim 1 reads as follows:

"1. An aqueous polyurethane dispersion comprising:

A. at least one isocyanate terminated polyurethane prepolymer [prepolymer (P), herein after] prepared by reacting in the presence of at least one pyrrolidone [(b-pyrrolidone, herein after] selected from the group consisting of N-n-butylpyrrolidone, N-isobutylpyrrolidone, N-sec-butylpyrrolidone and N-tert-butylpyrrolidone, a mixture (M) which comprises:

(a) at least one polyisocyanate compound (a),
(b) at least one polyol compound (b), having a molecular weight Mw of 200 to 8000 and a hydroxyl functionality of 1.5 to 6,
(c) at least one water dispersible enhancing component having at least one hydrophilic group or potentially hydrophilic group [component (WD_H), herein after] and comprising:

i. x mmol/kg of at least one water dispersible enhancing compound having at least one anionic hydrophilic group or potentially anionic hydrophilic group [compound (WD_{HA}), herein after], and/or

ii. y mmol/kg of at least one water dispersible enhancing compound having at least one non-ionic hydrophilic group or potentially non-ionic hydrophilic group [compound (WD_{HN}) herein after], wherein

$$\frac{200x+70y}{x+y} < x+y < \frac{560x+248y}{x+y}$$

and at least one of x or y is different from 0 and all mmol/kg are based on the weight of all the components initially present in the mixture (M),

B. optionally, at least one isocyanate-reactive compound [compound (I)] herein after], different from the polyol compound (b) and different from the component (WD_H), having reactive groups chosen among alcoholic hydroxyl groups or primary or secondary amino group; and

C. water".

III. The following documents were inter alia submitted during the opposition proceedings:

D1: DE 10 2007 028 890 A1
D2: US 2007/0197720 A1
D4: WO 2013/107822 A1

IV. The decision under appeal, as far as it is relevant to the present appeal concluded that the subject-matter of granted claim 1 was novel over D1 and D2 and involved an inventive step starting from D1 as the document representing the closest prior art in combination with D4.

V. The opponent (appellant) lodged an appeal against the decision of the opposition division.

VI. The patent proprietor (respondent) submitted five sets of claims as auxiliary requests 1-5 with the rejoinder to the statement of grounds of appeal of the appellant. With letter of 16 June 2023 the respondent filed additional experiments.

VII. Oral proceedings before the Board were held on 20 September 2024.

VIII. The final requests of the parties were as follows:

- The appellant requested that the decision of the opposition division be set aside and that the patent be revoked.

- The respondent requested that the appeal be dismissed or that the patent be maintained on the basis of any one of auxiliary requests 2-5 submitted with the statement of grounds of appeal.

Claim 1 of auxiliary request 2 corresponded to claim 1 as granted (main request) in which the formula was amended to:

$$\frac{240x+90y}{x+y} < x+y < \frac{350x+150y}{x+y}$$

Claim 1 of auxiliary request 3 corresponded to claim 1 of the main request in which the list of pyrrolidones was limited to N-n-butylpyrrolidone.

Claim 1 of auxiliary request 4 corresponded to claim 1 of the main request in which the definition of component c) was amended as follows (deletion in

strikethrough and additions in bold):

"(c) at least one water dispersible enhancing component having at least one hydrophilic group or potentially hydrophilic group [component (WDH), herein after] and comprising:
i. x mmol/kg of at least one water dispersible enhancing compound having at least one anionic hydrophilic group or potentially anionic hydrophilic group [compound (WD_{HA}), herein after], ~~and/~~**or**
ii. **x mmol/kg of the compound (WD_{HA}) and** y mmol/kg of at least one water dispersible enhancing compound having at least one non-ionic hydrophilic group or potentially non-ionic hydrophilic group [compound (WD_{HN}) herein after],
wherein

$$\frac{200x+70y}{x+y} < x+y < \frac{560x+248y}{x+y}$$

and ~~at least one of~~ x ~~or y~~ is different from 0 and all mmol/kg are based on the weight of all the components initially present in the mixture (M)".

Claim 1 of auxiliary request 5 corresponded to claim 1 of the main request in which the definition of component c) was amended as follows (deletion in strikethrough and additions in bold):

"at least one water dispersible enhancing component having at least one hydrophilic group or potentially hydrophilic group [component (WDH), herein after] and ~~comprising~~ **consisting essentially of**:
i. **200 to 560**~~x~~ mmol/kg of at least one water dispersible enhancing compound having at least one anionic hydrophilic group or potentially anionic hydrophilic group [compound (WD_{HA}), herein after],~~and/or~~

~~ii. y mmol/kg of at least one water dispersible enhancing compound having at least one non-ionic hydrophilic group or potentially non-ionic hydrophilic group [compound (WD_{HN}) herein after],~~

wherein

$$\frac{200x+70y}{x+y} < x+y < \frac{560x+248y}{x+y}$$

~~and at least one of x or y is different from 0 and~~ all mmol/kg are based on the weight of all the components initially present in the mixture (M)".

IX. The parties' submissions, in so far as they are pertinent to the present decision, may be derived from the reasons for the decision below. The disputed points concerned the admittance into the appeal proceedings of the additional experiments filed by the respondent with letter of 16 June 2023, novelty of the subject-matter of claim 1 as granted over D1 and inventive step of the subject-matter of claim 1 as granted and of claim 1 of auxiliary requests 2-5 in view of D1 as the closest prior art in combination with D4.

Reasons for the Decision

1. Admittance of experimental evidence

1.1 Additional experimental evidence (Table 1, examples E5', CE4' and CE7') was filed by the respondent after their rejoinder, with their letter of 16 June 2023 (page 2, third paragraph and discussion in section 3). The respondent argued that the new evidence was filed in direct response to sections 3.12-3.17 on pages 14/15 and sections 3.29-3.71 on pages 17-22 of the statement of grounds of appeal, in particular in response to the argument of the opponent concerning the lack of relevance of the examples of the patent in suit

disclosing the use of N-methylpyrrolidone (NMP) in the preparation of the aqueous polyurethane dispersions.

1.2 The admittance of the additional experimental evidence into the appeal proceedings was contested by the appellant (letter of 6 November 2023, section 29) especially since the objection of lack of relevance of examples E5, CE6 and CE7 of the patent in suit and their respective variations (E5a, CE6a, CE7a, E5b, CE6b and CE7b) had already been raised during the opposition proceedings (letter of the opponent of 6 November 2023, sections 29.2 and 29.5 referring to the letter of 16 March 2022, section 3.11). In particular, the appellant argued at the oral proceedings before the Board that the additional experiments should not be admitted under Article 12(6) RPBA on the grounds that they could and should have been filed earlier during the opposition proceedings.

1.3 It is apparent from the facts of the case that the additional experiments E5', CE4' and CE7' were filed after the rejoinder of the patent proprietor. The respondent further did not contest at the oral proceedings before the Board that the additional experiments E5', CE4' and CE7' were in fact filed in reaction to the objection the opponent made during the opposition procedure, in their letter of 16 March 2022. In view of this, it is apparent that the additional experiments could have been filed, or at least announced, during the opposition procedure.

1.4 Article 12(6) RPBA (which applies also under the conditions of Article 13(1) RPBA) lays out that the Board shall not admit requests, facts, objections or evidence which should have been submitted, or which were no longer maintained, in the proceedings leading

to the decision under appeal, unless the circumstances of the appeal case justify their admittance.

1.5 The respondent considered that the circumstances of the case justified the admittance of the additional experiments in appeal because of the short period of time between the letter of the opponent of 16 March 2022 and the oral proceedings before the opposition division (two months), preventing them from providing experimental evidence, and because of difficulties in designing and realising experiments shortly after the COVID pandemic due to shipping and scheduling issues. Furthermore, the issues addressed in the new experimental evidence were not complex, did not raise new objections and were not detrimental to the procedural economy.

1.5.1 While it could have been accepted that the short period of time between the argument of the opponent regarding the examples of the patent in suit and the oral proceedings before the opposition division could have hampered the design and schedule of additional experiments, especially at the end of the COVID pandemic, the Board does not see in the facts of the case any evidence that the patent proprietor effectively considered filing experiments in reaction to the objection of the opponent. The patent proprietor in particular did not address the objection of the opponent concerning the lack of relevance of the examples of the patent in suit in their later written response on 2 May 2022 nor did the patent proprietor hinted at an intention to provide any *ad hoc* additional experiments at any point including at the oral proceedings proceedings before the opposition division or in their rejoinder in appeal. In view of this, the respondent has not established with factual evidence

that there were circumstances that could have justified the filing of the additional experiments at such a late stage and therefore their admittance.

1.5.2 The Board therefore decided to exercise its discretion under Article 13(1) RPBA (also in view of Article 12(6) RPBA) by not admitting the additional experimental evidence filed with letter of 16 June 2023 into the appeal proceedings.

Main request (claims as granted)

2. Novelty over D1

2.1 The opposition division came to the conclusion that claim 1 as granted was novel over the disclosure of document D1. The appellant contested that conclusion in appeal (statement of grounds of appeal, item 2).

2.2 Paragraph 40 of D1 was cited by the appellant as a relevant passage relating to the preparation of polyurethane water dispersions (statement of grounds of appeal, section 2.9). According to that passage the water dispersions were produced by:

"I. Preparation of a polyurethane by reacting
a) at least one polyfunctional isocyanate having 4 to 30 carbon atoms,
b) diols, of which
b1) 10 to 100 mol%, based on the total amount of diols (b), have a molecular weight of from 500 to 5000, and
b2) from 0 to 90 mol%, based on the total amount of the diols (b), have a molecular weight of 60 to 500 g/mol,

c) optionally polyvalent compounds that are different from the diols (b) with reactive groups which are alcoholic hydroxyl groups or primary or secondary amino groups and
d) monomers other than monomers (a), (b) and (c) having at least one isocyanate group or at least one isocyanate reactive group which monomers have at least a hydrophilic group or a potentially hydrophilic group, thereby causing the water dispersibility of the polyurethanes,
to form a polyurethane in the presence of at least one solvent according to the invention and
II. subsequent dispersion of the polyurethane in water,
III. wherein optionally after or during step II polyamines can be added" (translation by the Board).

2.3 Paragraph 40 does not define the solvent used during the preparation of the polyurethane component but it is apparent from paragraph 19 of D1 that, in that context, the solvent can be selected from the group consisting of
L1) a mixture of at least one N-(cyclo)alkylpyrrolidone (emphasis added by the Board) L1a) and at least one di(cyclo)alkyldipropylenglycolether L1b) and
L2) at least one N-(cyclo)alkylcaprolactam,
wherein the (cyclo)alkyl radical of the N-(cyclo)alkylpyrrolidone L1a) has at least 2 carbon atoms.

2.4 Paragraph 31 of D1 further discloses that the N-(cyclo)alkylpyrrolidones L1a) can be, for example, N-ethylpyrrolidone, N-n-propylpyrrolidone, N-isopropylpyrrolidone, N-n-butylpyrrolidone, N-isobutylpyrrolidone, N-sec-butylpyrrolidone, N-tert-butylpyrrolidone, N-cyclopentylpyrrolidone or N-

cyclohexylpyrrolidone, preferably N-ethylpyrrolidone.

2.5 The opposition division concluded that in order to arrive at a solvent as defined in granted claim 1 the selection of N-n-butylpyrrolidone (NBP) had to be made within the disclosure of D1.

2.6 The opposition division also concluded that a further selection was needed among the monomers d) disclosed in paragraphs 73, 74, 83, 88 and 93 of D1 in order to arrive at a water dispersible enhancing component having one hydrophilic group defined as component c) in granted claim 1 (pages 6 and 7 of the decision under appeal).

2.7 The compound of interest in D1 is disclosed as the monomer d) with anionic hydrophilic groups (paragraph 73) falling under the definition of (WD_{HA}) in granted claim 1. The opposition division considered that D1 ultimately disclosed such a compound (especially the preferred dimethylolpropionic acid (DMPA) in paragraph 83). Since it was found that the amount of components with hydrophilic groups (upper value of the preferred range of 80-300 mmol/kg) applied to all components (ionic and non-ionic) in paragraph 74 (seen to be confirmed by paragraph 93) at least a further selection was needed within D1 to arrive at claim 1 of the main request. There was in particular no explicit disclosure of the use of anionic hydrophilic monomers d) alone in D1 which corresponded to choosing y=0 in the formula of granted claim 1 in order to arrive at the water dispersible enhancing component (c) of that claim.

2.8 The opposition division therefore concluded that the subject matter of granted claim 1 was novel over D1 on the grounds that two selections were necessary to

arrive at the claimed subject matter of the patent in suit, namely, the selection of a N-butylpyrrolidone (NBP) as the solvent and the selection that the prepolymer only contained anionic hydrophilic compounds (i.e. y=0 in the Formula defined in granted claim 1). The appellant contests that conclusion in appeal on the grounds that the subject matter of granted claim 1 was explicitly disclosed in D1 (statement of grounds of appeal, section 2).

2.9 Starting from the disclosure of paragraph 40 which discloses the preparation of a polyurethane (which can be also seen as a prepolymer in the wording of granted claim 1), the question of novelty depended on whether D1 disclosed in combination the use of i) N-n-butylpyrrolidone, N-isobutylpyrrolidone, N-sec-butylpyrrolidone and N-tert-butylpyrrolidone as a solvent and ii) at least one water dispersible enhancing component as defined in granted claim 1 in such a preparation.

2.9.1 The preparation of the polyurethane in paragraph 40 of D1 mentions the use of (inventive) solvents which are not further defined in that passage. It is, however, implicit that the solvents used are those discussed in paragraphs 19-39 of D1. The appellant specifically points to the disclosure of paragraph 31 which lists, as N-(cyclo)alkylpyrrolidones solvents L1a), N-ethylpyrrolidone, N-n-propylpyrrolidone, N-isopropylpyrrolidone, N-n-butylpyrrolidone, N-isobutylpyrrolidone, N-sec-butylpyrrolidone, N-tert-butylpyrrolidone, N-cyclopentylpyrrolidone or N-cyclohexylpyrrolidone, preferably N-ethylpyrrolidone.

2.9.2 In order to arrive at the specific list of NBPs (N-n-butylpyrrolidone, N-isobutylpyrrolidone, N-sec-

butylpyrrolidone, N-tert-butylpyrrolidone, this group being referred to as NBPs hereafter) relevant for granted claim 1, the skilled reader has to select first the mixture of solvents L1) (as defined in paragraph 19) which implies the use of a whole class of solvents (N-(cyclo)alkylpyrrolidones) L1a). That class is further defined in paragraph 24 in more detailed terms before specific examples are given in paragraph 31. Paragraph 31 recites examples of possible N-(cyclo)alkylpyrrolidones L1a among which one finds the NBPs. It is also apparent from paragraph 31 that N-ethylpyrrolidone is the preferred solvent but none of the NBPs are. In view of this, the Board finds that the use of any of the NBPs disclosed in paragraph 31 is a first selection that has to be made within D1 in order to arrive at the NPBs listed in granted claim 1.

2.9.3 The preparation of the polyurethane in paragraph 40 of D1 mentions the use of monomers (d) other than (a), (b) and (c) having at least one isocyanate reactive group which monomers have at least a hydrophilic group, thereby causing the water dispersibility of the polyurethanes. These monomers (d) correspond to the water dispersible enhancing component having one hydrophilic group defined in granted claim 1. The use of the plural form in paragraphs 40 and 73 for the definition of (d) ("verschiedene Monomere") leaves open the presence of one or more of these components in the preparation.

2.10 The monomers (d) mentioned in paragraph 40 are further characterized in paragraphs 73-93 of D1. Paragraph 73 cited by the appellant (statement of grounds of appeal, section 2.12) defines the hydrophilic groups that are part of these monomers (d) as being nonionic or, preferably ionic (i.e cationic or anionic) hydrophilic

groups and more preferably anionic hydrophilic groups. While that paragraph teaches that among the possible hydrophilic groups, anionic hydrophilic groups are preferred, this does not mean that only one type of monomer (d), those with anionic hydrophilic groups, is to be used in the preparation of polyurethanes. Paragraph 40 and the beginning of paragraph 73 consider the possible use of more than one monomer (d) and this also seems to be in line with the wording of paragraph 74 ("The amount of component**s** with (potentially) hydrophilic groups", translation and emphasis added by the Board). It is therefore apparent that a further selection in the list of monomers (d) is needed within D1 to arrive at a polyurethane preparation according to paragraph 40 in which only one monomer (d) is used that contains anionic hydrophilic groups. That selection is especially relevant in view of the disclosure of the amount of the monomer (d) in paragraph 74.

2.11 Paragraph 74 further discloses ranges of amounts for the (potentially) hydrophilic groups of 30-1000, preferably 50-500 and most preferably 80-300 mmol/kg for which it is apparent that the upper values of the preferred (500 mmol/kg) and most preferred (300 mmol/kg) ranges fall under the range of amounts (x and y) of the anionic and non-ionic water dispersible enhancing compounds defined by the formula only when y is selected to be 0 in granted claim 1 (leading to $200<x<560$).

2.12 In view of this, the Board finds that multiple selections concerning the nature of the solvent (selection of NBP) and the monomer (d) (presence of anionic groups and amount thereof of 500 mmol/kg or 300 mmol/kg) have to be made in the disclosure of D1 in order to arrive at claim 1 of the main request and that

a direct and unambiguous disclosure of the combination deriving from these selections is not to be found in D1. On that basis, the Board concludes that claim 1 of the main request is novel over D1.

3. Inventive step

3.1 D1 was found to represent the closest prior art in the decision under appeal (section 2.1.1, starting on page 7). This selection was adopted by the parties in appeal and the Board has no reason to consider a different starting point.

3.2 As established in the novelty section, claim 1 of the main request differs from D1 in that NBPs were used as solvent together with an anionic water dispersible enhancing compound in an amount in the range defined in claim 1 of the main request.

3.3 The opposition division found that the examples and comparative examples of the patent in suit showed that NBP could be used in place of N-methylpyrrolidone (NMP) and produce a polyurethane dispersion (PUD) having comparable properties (such as a similar coalescence) (decision under appeal, page 9, third paragraph). The appellant contested that conclusion and argued that the only technical effect associated with the use of NBP in the patent in suit was that the resulting polyurethane dispersion had a lower toxicity than the same polyurethane dispersion prepared using NEP (statement of grounds of appeal, page 14, point 3.4). It was in particular contested that the comparative examples shown in the patent in suit represented the closest prior art D1 since the comparative examples were mostly based on a solvent (NMP) that was not part of the disclosure of D1. The appellant formulated the problem

as the provision of a less toxic polyurethane dispersion (statement of grounds of appeal, section 3.115).

3.4 The respondent by contrast formulated the problem as the provision of a more environment-friendly aqueous polyurethane dispersion which was less reprotoxic while at least maintaining good wet dispersion properties thereof such as in terms of appearance, coalescence, and heat age stability, i.e. meaning that the wet dispersion properties of said aqueous polyurethane dispersion should not be negatively affected or impaired (rejoinder, page 35).

3.5 Concerning the effects alleged by the respondent, it is established case law of the Boards that an unexpected effect demonstrated in a comparative test can be taken as an indication of inventive step on the condition that the nature of the comparison with the closest state of the art must be such that the alleged advantage or effect is convincingly shown to have its origin in the distinguishing feature of the invention compared with the closest state of the art (Case Law of the Boards of Appeal, 10th Edition 2022, I.D.4.3.2).

3.6 The following advantages/disadvantages are mentioned in the patent in suit:

i) the environmental friendliness of the organic solvent chosen for the preparation (low volatile organic compound content, paragraphs 2 and 11),

ii) the known reprotoxicity of NMP commonly used as solvent (paragraph 9) and

iii) improved coalescence of the films as well as

improved mechanical properties and improved chemical resistance (paragraph 11).

The respondent reformulated the latter effects as being improved wet dispersion properties, in particular appearance, heat age stability and coalescence (rejoinder, page 22, third paragraph). The respondent relied on Table 1 provided with their rejoinder to the statement of grounds of appeal (pages 18 and 19) to show these effects as arising from the distinguishing features of granted claim 1 over D1.

3.7 The effect of the environmental friendliness is linked to the amount of solvent present in the wet dispersion (paragraphs 2, 11 and 185 of the patent in suit). The argumentation of the respondent relies on the results provided for the example E5/E5a/E5b and comparative examples CE6/CE6a/CE6b and CE7/CE7a/CE7b in Table 1 (rejoinder, pages 27-35).

3.7.1 The examples and comparative examples E5, CE6 and CE7 cited by the respondent disclose the preparation of aqueous polyurethane dispersions in the presence of NBP (E5), NMP (CE6) or NEP (CE7) in the same amount (60g) and with the same amount of DMPA (anionic water dispersible enhancing component).

3.7.2 It is apparent that comparative example CE6 uses NMP as a solvent which is not a solvent according to D1 since NMP is not part of the list of solvents in paragraph 31 and it is even disclosed as being one solvent to avoid due to its known toxicity (paragraph 4). Since the question to be answered concerns the problem successfully solved over the closest prior art by the claimed subject-matter, i.e. the result of the distinguishing feature meant to be operated vis-à-vis

the starting point to arrive at the claimed subject-matter, it is *per se* apparent that in order to demonstrate that an alleged effect or advantage resulting from the distinguishing feature is observed, it must be credible that the effect or advantage takes place in the context of the closest prior art. It follows that the comparative examples of the patent in suit based on the use of NMP as a solvent during the preparation of aqueous polyurethane dispersions are not representative of D1 and are therefore not relevant for the formulation of the problem solved over that document. It follows that only the comparisons of NBP to NEP can be seen as being relevant to the present question of inventive step.

3.7.3 With regard to the relevant data, the dispersions obtained in examples E5 (NBP) and CE7 (NEP) are said to be initially semi-translucent and the coalescence is said to be initially poor. The dispersions obtained in E5 (NBP) and CE7 (NEP) therefore seem to be very comparable in terms of their wet dispersions properties (heat age stability is not measured). It is therefore apparent that examples E5 and CE7 do not establish the presence of any improvement resulting from the presence of NBP (as a solvent) during the preparation of the polyurethane over NEP as the preferred solvent used in D1. These examples of the patent in suit therefore do not credibly show an effect of the use of NBP over NEP during the preparation of the aqueous polyurethane dispersion according to claim 1 of the main request.

3.7.4 The respondent also considered examples E5a and CE7a in Table 2 of the patent in suit (rejoinder, page 28, first paragraph) as examples showing that the two dispersions obtained according to E5 and CE7 could be coalesced through the addition of NBP (E5a: 1.75g) or

NEP (CE7a: 7.00g) after the preparation of the dispersion. Examples E5a and CE7a in particular showed that less NBP was needed to obtain coalescence than NEP. It is clear from the data and from the arguments of the respondent that the effect allegedly shown in examples E5a and CE7a is linked to the supplementary addition of solvent to the aqueous polyurethane dispersion after its production (for example E5a using NBP in paragraph 165). That step of adding NBP after the preparation of the aqueous polyurethane dispersion as shown in examples E5a and CE7a is however not part of the steps of the preparation of the aqueous polyurethane dispersion defined in claim 1 of the main request because that claim only requires the presence of at least one pyrrolidone such as NBP during the preparation of the dispersion. Since the post-addition step of NBP to an aqueous polyurethane dispersion is not a feature of claim 1 of the main request, possible effects related to that feature cannot be taken into account in formulating the technical problem solved by the subject-matter of claim 1. The Board therefore finds that E5a and CE7a are not relevant to the present question of inventive step over D1. The same conclusion applies to examples E5b and CE7b of the patent in suit in which the same amount of NBP or NEP was added to the dispersions according to E5 and CE7 (3.00g) after the aqueous polyurethane dispersions were produced.

3.8 The respondent additionally argued that the patent in suit showed an effect of the use of specific pyrrolidones, such as NBP, on the reprotoxicity of the produced aqueous polyurethane dispersions (rejoinder, page 22, second paragraph).

3.8.1 With respect to the reprotoxicity aspect discussed in the patent in suit (paragraphs 9 and 21) and in D1

(paragraph 4) it is apparent that the purpose of D1 was to avoid using N-methylpyrrolidone (NMP) (D1, paragraph 4) and if a solvent of the type L1 (containing L1a) was to be used (paragraph 20) then L1a was, "for example, N-ethylpyrrolidone, N-n-propylpyrrolidone, N-isopropylpyrrolidone, N-n-butylpyrrolidone, N-isobutylpyrrolidone, N-sec-butylpyrrolidone, N-tert-butylpyrrolidone, N-cyclopentylpyrrolidone or N-cyclohexylpyrrolidone, preferably N-ethylpyrrolidone" (paragraph 31). There is no mention of the use of NMP as a solvent in the process disclosed in D1 and as such comparisons made with the reprotoxicity of NMP are not relevant to the question of inventive step of granted claim 1.

3.8.2 It is, however, not in dispute between the parties that NEP, taught to be the preferred solvent in D1, is also known as being reprotoxic (patent in suit, paragraph 21 and statement of grounds of appeal, section 3.23) and that NBP was not or was less reprotoxic than NEP. It follows that it can be accepted, considering the greater reprotoxicity of NEP over NBP as acknowledged by the parties, that the aqueous polyurethane dispersions according to granted claim 1, which are obtained in the presence of NBP instead of NEP as in D1, can be seen as being not or less reprotoxic than the aqueous polyurethane dispersions of the closest prior art D1.

3.9 The respondent further argued that the patent in suit and in particular examples E1, CE2, E3, CE4, E8, CE9, E10, CE11 and CE12 showed that the use of NBP resulted in improved dispersions in terms of their wet dispersion properties in particular appearance, heat age stability and coalescence (rejoinder, page 22, third paragraph). The appellant contested the presence

of that effect on the grounds that the relevant comparative examples of the patent in suit (summarized in Table 1 on pages 18 and 19 of the rejoinder) used NMP and not NEP as used in the closest prior art D1 in the preparation of the aqueous polyurethane dispersions.

3.9.1 It is apparent that among the comparative examples mentioned by the respondent only comparative examples CE7 and CE12 used NEP during the preparation of aqueous polyurethane dispersions and are therefore relevant to the present question of inventive step (see point 3.6.2 above) while in the remaining comparative examples NMP (CE2, CE4, CE9 and CE11), which is not a solvent according to D1, was used.

3.9.2 The examples in which NEP was used as a solvent (CE7 respectively CE12) can be compared to two valid examples according to granted claim 1 in which NBP was used in the same conditions (E5 respectively E10). The results summarized in Table 1, however, show that the aqueous polyurethane dispersion according to example E5 (with NBP as solvent) does not have improved properties when compared to the dispersion of comparative example CE7. Example E10 and comparative example CE12 show the preparation of aqueous polyurethane dispersions that only differ from one another in that NBP was used in the course of the preparation of the dispersion in E10 while NEP was used in CE12. The comparison of these examples appears to show that the use of NBP leads to an aqueous polyurethane dispersion while the use of NEP does not (a coagulated gel was obtained). It is however apparent that a specific combination of water dispersible enhancing compounds was used in the dispersions of example E10 and comparative example CE12 (a combination of an anionic compound (DMPA) and a non-

ionic compound YMER N120 defined in paragraph 140 of the patent in suit) in a specific ratio (50 parts of DMPA to 100 parts of YMER N120). While claim 1 of the main request concerns an aqueous polyurethane dispersion that may contain an anionic or non-ionic water dispersible enhancing compound or the combination of the two of them in an amount defined by a formula (claim 1), the validity of the effect shown in the comparison is limited to a combination of both anionic and non-ionic water dispersible enhancing compounds in a specific ratio (50 parts of DMPA to 100 parts of YMER N120), while it cannot be seen in different conditions, e.g. those in E5 and CE7. The Board does also not find further evidence on file from which it could be concluded that the effect derivable from the comparison of examples E10 and CE12, which is merely limited to the successful preparation of a coalesced aqueous dispersion, would be valid over the whole scope of claim 1 of the main request which also comprises the presence of only one (anionic or non-ionic) water dispersible enhancing compound.

3.9.3 With respect to the use of a water dispersible enhancing component during the preparation of the aqueous polyurethane dispersion, it is undisputed that all the examples and comparative examples use a component or mixture of components that are according to granted claim 1. While it is argued by the respondent that the components and their amounts in the preparation were not chosen arbitrarily, it is apparent that the examples and comparative examples on file cannot show an effect resulting from the selection of specific types of component or their amounts according to granted claim 1 since no comparison is offered with components and amounts that are not according to the claim. In view of this, the Board cannot conclude that

the selection of the water dispersible enhancing component brings any improvement over those disclosed in D1.

3.10 On the basis of the analysis above (sections 3.6-3.9) the Board concludes that the technical problem, when starting from the preparation disclosed in D1, should be formulated as the provision of a non or less reprotoxic aqueous polyurethane dispersion.

3.11 The teaching of D4 was cited in the decision under appeal as one showing that NBP was less reprotoxic than both NMP and NEP (decision under appeal, page 12) which is also the argument made by the appellant in appeal (statement of grounds of appeal, sections 3.119-3.124).

3.12 Indeed document D4 teaches the use of NBP instead of NMP or NEP as a non reprotoxic solvent (page 4, first three paragraphs). That general teaching of D4 is especially relevant to the closest prior art because D4 also mentions its use in the preparation of polyurethanes (page 11, lines 12-30, in particular line 21). In view of the problem formulated over D1, the Board finds that the use of NBP instead of NEP in the preparation of aqueous polyurethane dispersions as generally disclosed in D1 does not involve an inventive step in view of the teaching of D4.

3.13 As to the water dispersible enhancing compound (which is not related to the issue of reprotoxicity), D1 itself discloses the possible use of a non-ionic or anionic water dispersible enhancing compound as monomer (d) in paragraph 73 and the upper limit of the preferred amount of any of these components, therefore also applying to the anionic component, as 300 mmol/kg in paragraph 74. Since it was not shown, nor is there

any reason to assume in the prior art documents cited, that a skilled person would not have considered the use of 300 mmol/kg of an anionic water dispersible enhancing compound in combination with NBP in the preparation of aqueous polyurethane dispersions, and the amount is considered as an arbitrary one (see section 3.9, above), the Board finds that that combination of solvent and water dispersible enhancing compound in a specific amount would have been obvious to the skilled person, when aiming at solving the posed problem.

3.14 The Board concludes that claim 1 of the main request lacks an inventive step over D1 as the closest prior art.

Auxiliary requests 2-5

4. Inventive step

4.1 Claim 1 of auxiliary request 2 corresponded to claim 1 of the main request in which the formula defining the amounts of x and y of the anionic (x) and non-ionic (y) water dispersible enhancing components was amended to:

$$\frac{240x+90y}{x+y} < x+y < \frac{350x+150y}{x+y}$$

4.2 The amendment in claim 1 of auxiliary request 2 limits the range of amounts of the water dispersible enhancing components which ultimately results, when an anionic water dispersible enhancing component only is used in the preparation of the aqueous polyurethane dispersion (y=0), in a maximum amount of that component of 350 mmol/kg, thereby excluding examples E5, CE6, CE7 (which use 357 mmol/kg of DMPA) and examples E8 and CE9 (which use 486 mmol/kg of DMPA) from the examples of the

patent in suit that are representative of the subject-matter of claim 1 and could show the presence of an effect over D1.

4.3 The Board does, however, not find in the examples of the patent in suit that are according to claim 1 of auxiliary request 2 (examples E1, E3 and E10) and the corresponding comparative examples a meaningful comparison that could show the presence of an effect resulting from the choice of NBP over NEP or from the use of water dispersible enhancing compound(s) in the amount defined in claim 1 of auxiliary request 2 over D1. As for claim 1 of the main request, the comparison shown in examples E10 and CE12 is limited to the use of two water dispersible enhancing compound(s) in specific amounts and there are no further valid comparisons showing an effect of the use of NBP over NEP.

4.4 The respondent further submitted at the oral proceedings before the Board that a comparison of examples E1, E3 and E8 showed that the use of an anionic water dispersible enhancing compound (DMPA) only in an amount in the range defined in claim 1 of auxiliary request 2 (240 to 350 mmol/kg) as in examples E1 (245 mmol/kg) and E3 (288 mmol/kg) resulted in aqueous polyurethane dispersions with more manageable brookfield viscosities (E1: 400 mPa.s; E3: 330 mPa.s) than in the case of example E8 in which the use of 486 mmol/kg of DMPA led to a dispersion with a brookfield viscosity of 7000 mmol/kg. The Board, however, finds that examples E1, E3 and E8 cited by the respondent not only differed from one another in the amounts of anionic water dispersible enhancing compound DMPA, but also in the amounts of NBP used during the preparation of the dispersions. It is in particular apparent that the amounts of NBP (E1: 57.17g in paragraph 152 of the

patent in suit; E3: 40g in paragraph 160 and E8: 81g in paragraph 179) differed significantly from one another and it cannot be excluded that the amounts in NBP in the dispersions may have significantly influenced the brookfield viscosities of the dispersions (E3: 40g NBP, viscosity of 330 mPa.s; E1: 57.17g NBP, viscosity of 400 mPa.s and E8: 81g NBP, viscosity of 7000 mPa.s). Since the argument of the respondent based on the viscosity was presented for the first time in appeal at the oral proceedings before the Board, its validity and the possible influence of the amount in NBP thereon could not be further assessed. The Board can therefore only come to the conclusion that the comparison of examples E1, E3 and E8 does not unambiguously show the presence of an effect resulting from the choice of an amount of anionic water dispersible enhancing compound according to claim 1 of auxiliary request 2.

4.5 The Board therefore comes to the conclusion that claim 1 of auxiliary request 2 lacks an inventive step over D1 for the same reasons as claim 1 of the main request.

4.6 Claim 1 of auxiliary request 3 corresponded to claim 1 of the main request in which the the list of pyrrolidones was limited to N-n-butylpyrrolidone (NBP). Both parties at the oral proceedings before the Board relied on their argumentation provided for the main request. Since NBP is a solvent that is listed in paragraph 31 of D1 and is also the solvent taught to be less toxic in D4, the Board finds that claim 1 of auxiliary request 3 lacks an inventive step for the same reasons as outlined for claim 1 of the main request.

4.7 Claim 1 of auxiliary request 4 corresponded to claim 1 of the main request for which the amendment concerning

the water dispersible enhancing compounds c) limited claim 1 to the use of either i) at least one water dispersible enhancing compound having at least one anionic hydrophilic group or ii) a combination of water dispersible enhancing compounds, one having at least one anionic hydrophilic group and one having at least one non-ionic hydrophilic group. It is apparent that the first option i) in claim 1 of auxiliary request 4 corresponds to that already considered in the inventive step assessment of claim 1 of the main request. Both parties at the oral proceedings before the Board also relied on the arguments they provided for the main request at this juncture. Since the assessment of inventive step made for claim 1 of the main request directly applies to claim 1 of auxiliary request 4, the Board comes to the conclusion that claim 1 of auxiliary request 4 lacks an inventive step over D1.

4.8 Claim 1 of auxiliary request 5 corresponded to claim 1 of the main request limited to the use of 200 to 560 mmol/kg of at least one water dispersible enhancing compound having at least one anionic hydrophilic group. Claim 1 of auxiliary request 5 therefore corresponded to the subject matter already addressed in the inventive step assessment of the main request over D1. Both parties at the oral proceedings before the Board also relied on the arguments they provided for the main request. Since the assessment of inventive step made for claim 1 of the main request directly applies to claim 1 of auxiliary request 5, the Board comes to the conclusion that claim 1 of auxiliary request 5 lacks an inventive step over D1.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.

2. The patent is revoked.

The Registrar: The Chairman:

D. Hampe D. Semino

Decision electronically authenticated